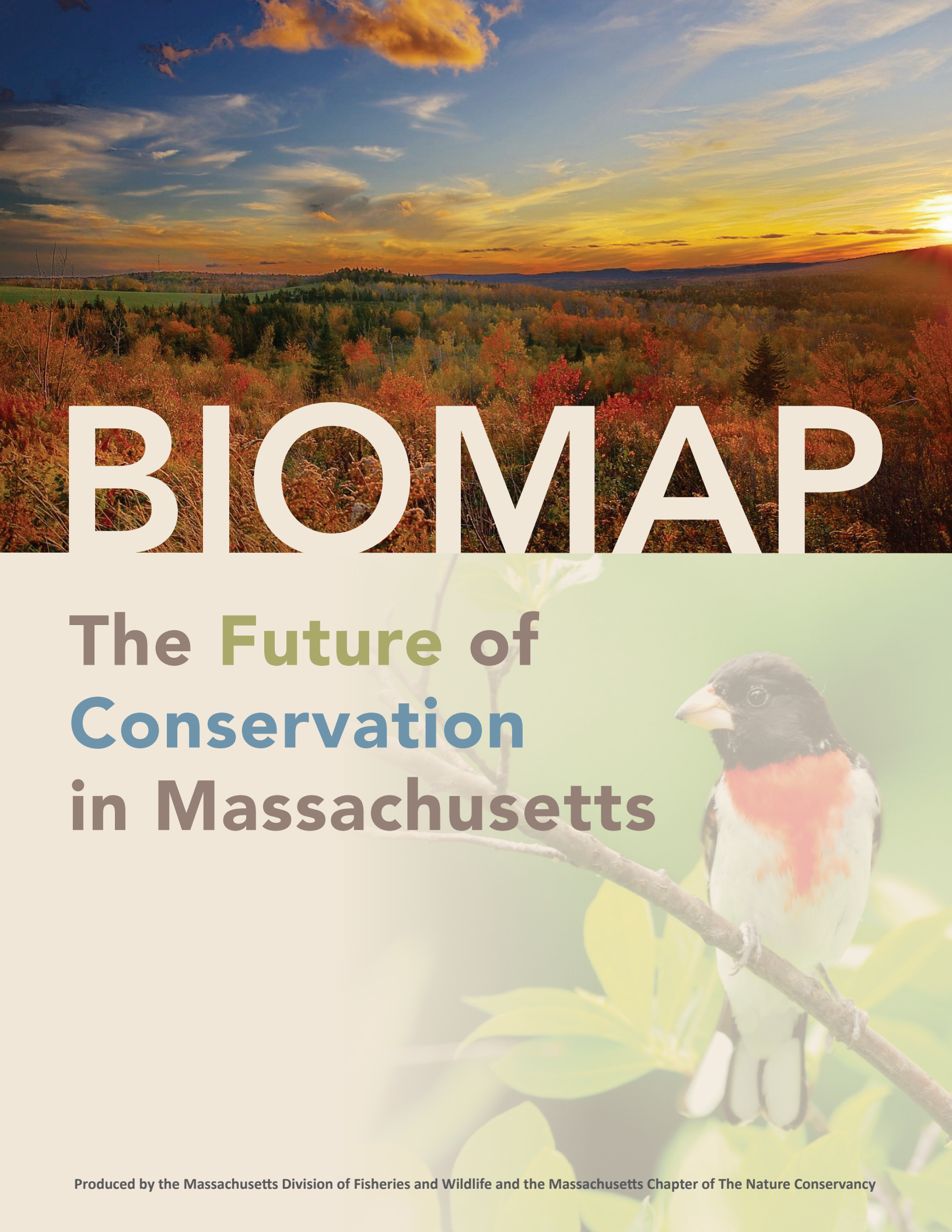
BIOMAP

The Future of Conservation in Massachusetts



Produced by the Massachusetts Division of Fisheries and Wildlife and the Massachusetts Chapter of The Nature Conservancy

THE POWER OF PARTNERSHIP

BioMap is the result of an ongoing collaboration between MassWildlife and the Massachusetts Chapter of The Nature Conservancy (TNC). With similar missions, goals, and science-based approaches to conservation, MassWildlife and TNC are natural partners to produce and maintain BioMap. This latest version of BioMap combines more than 40 years of rigorously documented rare species and natural community records from MassWildlife's Natural Heritage and Endangered Species Program (NHESP) with spatial data identifying intact fish and wildlife communities, habitats, and ecosystems that are the focus of the Massachusetts State Wildlife Action Plan (SWAP). BioMap also integrates TNC's Resilient and Connected Landscape analysis of large, well-connected, intact ecosystems and landscapes across the Commonwealth.

The Massachusetts Division of Fisheries and Wildlife (MassWildlife) is the state agency responsible for the conservation of all freshwater fish and wildlife in Massachusetts. MassWildlife also protects, manages, and restores land for wildlife to thrive and for people to enjoy. MassWildlife's Natural Heritage and Endangered Species Program (NHESP) is responsible for conserving and protecting the most vulnerable native animal and plant species of Massachusetts and the habitats upon which they depend. Currently, there are more than 400 native plants, vertebrates, and invertebrates listed as Endangered, Threatened, or of Special Concern under the Massachusetts Endangered Species Act.

The Nature Conservancy (TNC) is a global conservation organization dedicated to conserving the lands and waters on which all life depends. Guided by science, TNC creates innovative solutions to the world's toughest challenges so that nature and people can thrive. The Nature Conservancy uses a collaborative approach that engages local communities, governments, the private sector, and other partners. In Massachusetts, TNC is working with diverse partners to ensure healthy forests, wetlands, rivers, estuaries and fisheries, and fighting the causes of climate change while helping nature and people adapt to its impacts.

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the Massachusetts Division of Fisheries and Wildlife and the Massachusetts Chapter of The Nature Conservancy.

With support from:
the Massachusetts Executive Office of Energy and Environmental Affairs, the Massachusetts Department of Fish and Game, and numerous generous donors.

A MAP. A TOOL. A VISION.

A MAP

BioMap uses innovative mapping capabilities and the latest scientific data to deliver an interactive map that identifies those areas that are most critical for biodiversity conservation at multiple spatial scales.

A TOOL

BioMap is an online resource to help communities better understand biodiversity distribution and threats, and to strategically deploy limited resources to make real and lasting conservation impacts in Massachusetts.

A VISION

BioMap is a shared, unifying vision for a future where the people of the Commonwealth invest in the strategic protection and stewardship of lands and waters that are most important for conserving biological diversity. By making this investment, we will ensure a climate-resilient landscape that safeguards the diversity and abundance of our native species and the natural areas throughout the state that provide all people with ample access to nature and outdoor recreation, clean air, clean water, and health and well-being, now and for future generations.

EXECUTIVE SUMMARY

Massachusetts has a rich natural heritage, including forests, wetlands, rivers, grasslands, and coastline—all of which support a wide variety of plants and animals. The Commonwealth and its citizens have taken decisive action to conserve and protect habitats and open spaces for wildlife and to secure a future with clean air and water, healthy forests and landscapes that help mitigate climate change, and abundant opportunities for all people to enjoy the outdoors and spend time in nature. Nevertheless, today, this rich biodiversity is increasingly threatened by habitat loss and fragmentation, climate change, and invasive species. To meet these challenges and to achieve a bold and inclusive conservation vision for Massachusetts, MassWildlife and The Nature Conservancy created BioMap. Since its inception in 2001, this comprehensive tool has become a trusted source of information to guide conservation that is used by a wide spectrum of conservation practitioners. Today's BioMap builds on previous iterations with the continuing goal of protecting the diversity of species and natural ecosystems within the Commonwealth.

BioMap is more than a map. It is a map, a tool, and a vision for the people of the Commonwealth to come together to strategically protect, manage, and restore lands and waters that are most important for conserving biological diversity in Massachusetts now and into the future.

Access BioMap at mass.gov/biomap

AT A GLANCE

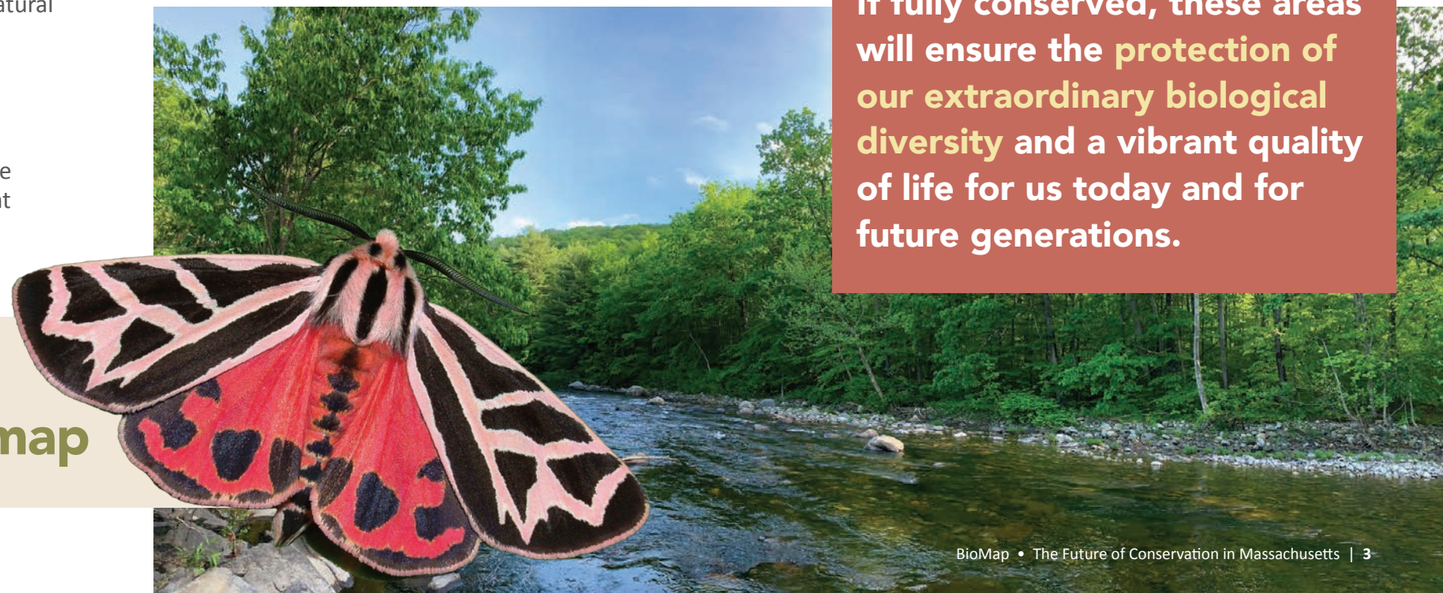
WHAT'S NEW?

The current BioMap incorporates enhanced knowledge of biodiversity and habitats, improved information on the threats to biodiversity, and new understandings of how to ensure that natural systems are more resilient in the face of climate change.

- Local and regional scaling, with features customized for use at the municipal level, and identification of regionally significant natural resources.
- New climate resilience data including TNC's Resilience and Connected Network analysis.
- New and updated data from MassWildlife's Natural Heritage and Endangered Species database.
- Enhanced Aquatic Core component based on thousands of aquatic field samples.
- Habitat management and restoration planning tools.
- The latest information on land use and land cover in Massachusetts.

BioMap identifies 2.4 M acres of Core Habitat and Critical Natural Landscapes of which approximately 44% (1.1 M acres) is protected.

If fully conserved, these areas will ensure the protection of our extraordinary biological diversity and a vibrant quality of life for us today and for future generations.



WHY WE NEED BIOMAP

A Conservation Opportunity for the Commonwealth

THE OPPORTUNITY

With nearly three million acres of forest, 1,500 miles of coastline, a vast network of rivers, and critical wetlands, Massachusetts' diverse natural ecosystems not only provide habitat for a wide variety of plants and animals but also offer vital ecological benefits to people. These rich natural systems filter our air; clean our water; provide food and economic opportunities; remove carbon from the atmosphere; mitigate the detrimental effects of climate change, such as flooding and drought; provide recreational opportunities; and enrich our health, well-being, and quality of life.

Massachusetts has seized the opportunity to conserve these vital resources through proactive land and water conservation and environmental policies. Success stories abound. Today, for example, more than 1.3 million acres of the Commonwealth are permanently protected from development. But we cannot stop there.

THE CHALLENGE

Despite these conservation successes, our biodiversity is in crisis, in Massachusetts and globally. Land development and road construction destroy and fragment habitat. Invasive species and emerging diseases threaten native wildlife, plants, and ecosystems. Pollution of our air, soil, oceans, and rivers degrades habitats, affecting the animals and plants that rely on them.

In addition, the increasingly severe effects of climate change exert stress on global biodiversity—and Massachusetts is not immune. In the coming years, Massachusetts will experience greater climate variability and greater extremes, which in turn will degrade habitats, making them uninhabitable for many species.

As a result of these challenges, the diversity and abundance of species around the globe are in decline. In Massachusetts, more than four hundred species are currently included on the Massachusetts Endangered Species List, and the threat of extinctions is growing. We must take urgent action if we are to reverse these trends.

BIOMAP: THE FUTURE OF CONSERVATION

To meet these challenges and to achieve a bold and inclusive conservation vision for Massachusetts, MassWildlife and TNC created BioMap, a comprehensive guide for strategic biodiversity conservation. With BioMap, users can gain a detailed understanding of habitats, species, and resilient landscapes, both locally and across the state. BioMap users can customize data and analyses to help them prioritize habitat protection and optimize use of limited conservation dollars.

BioMap also informs the stewardship of our natural resources. The data and online Habitat Restoration Resource Center can be used to plan habitat management and restore ecological processes. BioMap supports conservation that allows us to prepare for, recover from, and adapt to climate change, all with the goal of bolstering habitat resilience. Taken together, these efforts help to protect our extraordinary biodiversity now and into the future.

One third of species in the U.S. are vulnerable and one in five are at high risk of extinction
(National Wildlife Federation).

CONSERVATION IS FOR EVERYONE

The benefits of conserving nature extend beyond saving plants and animals. Safeguarding strong, healthy natural systems will provide us, and future generations, with landscapes essential to our health and well-being. But while the state's conservation community has made great strides in protecting and stewarding our land and waters, there continue to be disparities among communities when it comes to equitable distribution of these natural places. Comprehensive conservation must take into consideration efforts at both the statewide and local levels to prioritize equitable access to these vital natural areas. With its analysis and presentation of resources and conservation priorities at multiple scales, including at the local level, BioMap is an indispensable resource for all of Massachusetts.

3 billion birds have been lost in North America since 1970
(The Cornell Lab of Ornithology).

mass.gov/biomap

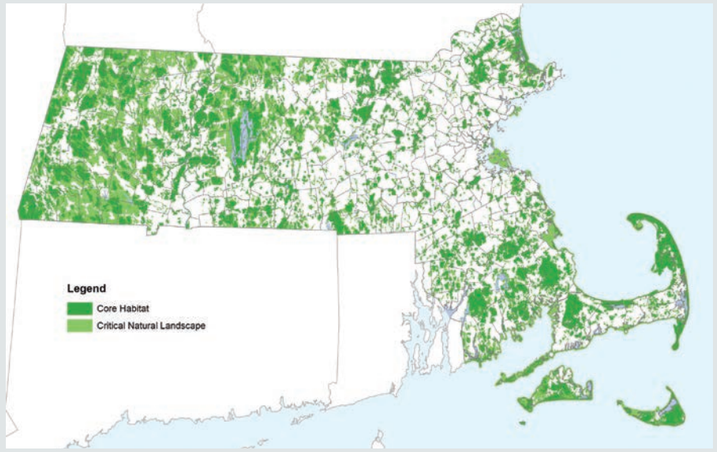
WHAT IS BIOMAP?

A Map. A Tool. A Vision.

THE NAME DOES NOT SAY IT ALL: BIOMAP IS MUCH MORE THAN A MAP.

A MAP

BioMap incorporates the most current scientific data in a new interactive online map that uses state-of-the-art digital mapping technologies to analyze and present information about the lands and waters in the Commonwealth that are most critical to protect. The map integrates data on climate resilience that help to identify those natural areas that are best equipped to adapt to the effects of climate change and to continue to support the species that depend on them. Users can customize the data display to meet their interests and needs; for example, by filtering by specific habitat types, and selecting data that is most relevant at local or statewide scales. The current BioMap also includes an exciting mapping tool that enables the user to draw or upload the boundaries of a specific project or geographic area and derive BioMap information and statistics for that area. The interactive map is dynamic and will be updated and enhanced as new data and new technologies become available.



A TOOL

BioMap is an invaluable resource for a spectrum of users at every scale–to learn, to prioritize, and to strategize conservation efforts. BioMap enables each user to optimize the use of limited conservation dollars. Concerned citizens can learn about at-risk species; grant writers can find precise information for their area of interest; municipal officials and members of local land trusts can dive into detailed local data; regional and statewide conservation organizations can integrate the data into plans and priorities; conservation practitioners at all levels can coordinate and collaborate with partners; and land managers can use BioMap's Habitat Restoration Resource Center to learn more about habitat restoration and management. As an aid to prioritization and collaboration, BioMap is an unparalleled tool to advance conservation.

A VISION

BioMap envisions a future in which the people of the Commonwealth invest in the strategic protection and stewardship of lands and waters that are most important for conserving biological diversity. Making this investment will ensure a future with healthy, robust ecosystems, safeguarding the diversity and abundance of Massachusetts plants, animals, and habitats. In this future, vital natural systems continue to protect us against the damaging effects of climate change and provide clean air, clean water, employment opportunities, and beautiful spaces for recreation, and all Massachusetts residents have access to nature and enjoy the benefits of our rich natural heritage. With BioMap, we can protect our extraordinary biological diversity and vibrant quality of life, now and for future generations.

UNDERSTANDING BIOMAP

BIOMAP CONSERVATION TARGETS ARE ORGANIZED INTO TWO MAIN ELEMENTS:

CORE HABITAT

Areas critical for the long-term persistence of rare species, exemplary natural communities, and resilient ecosystems.

RARE SPECIES CORE: Areas critical to the long-term conservation of our most vulnerable species and their habitats.

FOREST CORE: The most intact forests of Massachusetts, least impacted by development and essential for animals and plants dependent on remote habitat.

AQUATIC CORE: Intact aquatic habitats (rivers, streams, lakes and ponds) supporting a diversity of aquatic species and important physical and ecological processes.

WETLAND CORE: The most intact, least disturbed wetlands within resilient, less developed landscapes, with fewer stressors such as pollution.

VERNAL POOL CORE: Clusters of ecologically significant pools and intact surrounding upland habitat to ensure connectivity between pools.

PRIORITY NATURAL COMMUNITIES: Assemblages of plant and animal species with limited distribution and the best examples of common assemblages.

CRITICAL NATURAL LANDSCAPE

Large landscapes minimally impacted by development and buffers to core habitats and coastal areas, both of which enhance connectivity and resilience.

LANDSCAPE BLOCKS: Large areas of intact and connected forest, wetland, river, and coastal habitat that sustain healthy populations of countless species.

UPLAND BUFFERS OF AQUATIC AND WETLAND CORE: Upland areas adjacent to all Aquatic and Wetland Cores which support habitat function and enable species to move between habitat types.

COASTAL ADAPTATION AREAS: Areas adjacent to existing salt marshes that are most conducive to habitat movement as sea levels rise.

TERN FORAGING HABITAT: Offshore habitat used by state-listed Roseate, Arctic, Common, and Least Terns when feeding.

LOCAL AND REGIONAL COMPONENTS:

CONSERVATION AT DIFFERENT SCALES.

LOCAL COMPONENTS: To complement statewide habitats, BioMap includes habitats assessed and prioritized from the perspective of each city and town, which provide municipalities and local land trusts with additional information to support local decisions.

REGIONAL COMPONENTS: Massachusetts does not sit in isolation from the larger landscape of New England and the Northeastern U.S. BioMap identifies the habitats that are particularly important for regional conservation and the habitat connections that are critical for conservation success across the Northeast.

HABITAT RESTORATION

A CRITICAL PIECE OF THE BIOMAP CONSERVATION STRATEGY

Habitat restoration and management are key elements of the Commonwealth's BioMap conservation strategy. Land protection is essential, but protection alone is not enough to conserve the state's rich diversity of wildlife and plants. Massachusetts supports a diversity of habitats shaped by geology, climate, other natural processes, and the history of each locale. Examples include coastal dunes, oak woodlands, grasslands, and coldwater streams. In today's human-altered landscape, many habitats need active restoration and management to remove invasive species, restore natural processes, mitigate changes to water quality or quantity, and address other threats.

Visit the BioMap Habitat Restoration Resource Center!

BioMap provides information to help land managers design and implement habitat restoration and management projects. The resource center provides management recommendations for habitat types that are a priority for restoration in Massachusetts, and basic "how-to" information about management practices ranging from wetland restoration to grassland management and more.

mass.gov/restorehabitat

Habitat restoration and management benefit both common and rare wildlife. Many rare plants and animals protected by the MA Endangered Species Act and other declining species of conservation need identified in the MA State Wildlife Action Plan depend on open or shrubby habitats such as sandplain grasslands and pine barrens. Open habitats also benefit native pollinators, many of which are in decline with the suppression of natural disturbances such as fire and flooding, and we must replace those natural processes. Other vulnerable plants and animals benefit from wetland restoration or invasive plant control. Over 40% of rare and declining species in Massachusetts require active management of their habitats to thrive.

Habitat restoration and management are essential to achieving the BioMap conservation vision where all Massachusetts wildlife and plants can thrive. These activities also ensure quality outdoor recreation opportunities, including walking, birdwatching, hunting, fishing, and wildlife-viewing.

mass.gov/biomap

CLIMATE RESILIENCE

BIOMAP'S CLIMATE SOLUTIONS

Conservation of our state's natural resources to date has provided both nature and people with invaluable resilience in the face of climate change. But as climate impacts increase, and new science and strategies emerge, new tools will be needed.

BioMap has integrated the latest climate resilience science, designed to support both the diversity and abundance of native species as the climate changes. Protection and stewardship of BioMap's resilient habitats will help prevent population declines and species extinction, both globally and here in Massachusetts. BioMap uses several innovative methods and data sets to support climate resilience, with the following goals:

- Bolster vulnerable populations
- Provide climate change refugia
- Maintain local and regional connectivity
- Secure habitat diversity

TERRESTRIAL RESILIENCE: The Nature Conservancy's Resilience analysis identifies places that provide terrestrial species with options to move, adapt, and find suitable habitat in response to climate change. Conserving these sites with a variety of temperature and moisture conditions makes it more likely that wildlife and plant populations will be able to cope with climate impacts and thrive into the future. The analysis was incorporated directly into BioMap Forest and Wetland Cores and Landscape Blocks. BioMap also includes Regional Connectivity data and Coastal Adaptation Areas that support species and habitat shifts over time.

AQUATIC RESILIENCE: Aquatic Cores identify intact waterbodies that are well connected to the surrounding aquatic and terrestrial habitats that sustain them. These robust, diverse Aquatic Cores will be best positioned to sustain biological diversity and key ecosystem processes in the face of a changing climate. In addition, temperature models developed by United States Geological Survey were used to identify watersheds most likely to provide climate change refugia from increasing summer temperatures, particularly important for sensitive species like brook trout and brook floater.

SCALING BIOMAP

STATEWIDE, LOCAL, AND REGIONAL SCALING

BioMap augments statewide Core Habitat and Critical Natural Landscape by offering local and regional scaling of components to support specific conservation actions.

LOCAL COMPONENTS

Local components inform municipalities and others when making local decisions. These habitats protect wildlife and plants while also providing great benefits to local residents, including outdoor recreation, health and well-being, clean drinking water, storm and flood protection, and economic opportunities.

REGIONAL COMPONENTS

BioMap includes two regionally scaled components: Regional Rare Species and Regional Connectivity.

The **Regional Rare Species** data is a subset of the Rare Species Core for plants and animals that are globally and regionally imperiled. Massachusetts' conservation efforts, coupled with efforts in other states and/or countries, will reduce the risk of extinction or significant range reduction.

As species move, adapt, and shift their ranges in response to climate change, it will be critical that habitats and landscapes remain connected, both within Massachusetts and beyond the state borders. The **Regional Connectivity** layer shows areas that are particularly important for maintaining these large-scale connections.

LOCAL COMPONENTS INCLUDE LANDSCAPES, RARE SPECIES, AQUATIC HABITATS, WETLANDS, AND VERNAL POOLS.

Statewide Landscape Blocks Local Landscapes

When viewing the local versions of components, users should consider both statewide and local priorities for a given area, in this case Landscape Blocks and Local Landscapes. This integration ensures that statewide and community perspectives are considered together.

ACHIEVING THE VISION

MOVING CONSERVATION FORWARD

BioMap is a framework for the strategic protection and stewardship of lands and waters that are most important for conserving our state's rich natural heritage and ensuring a climate-resilient landscape.

Core Habitat and Critical Natural Landscape (CNL) are complementary and overlapping. Protection and stewardship of both are essential.

	Total Acres	Percent Protected
Core Habitat	1,520,000	49%
Critical Natural Landscape	2,090,000	46%
BioMap Total (with Overlap)	2,430,000	44%

BioMap is, fundamentally, a tool to plan and prioritize conservation actions. Users of all kinds—from local land trusts to statewide agencies—can fine-tune the application of data to achieve their unique conservation objectives and most effectively deploy their limited resources. Users can explore individual data layers, activate multiple data layers to see where components overlap, or dive into local layers to plan conservation actions for their city or town.

BioMap's flexibility supports a wide variety of conservation actions, including:

- **Land protection**
- **Habitat restoration**
- **Grant-writing**
- **Engaging private landowners**
- **Municipal open-space planning**
- **Climate resilience planning**
- **Energizing community members for conservation**

Biomap Core and CNL components each target important elements of biodiversity, while identifying habitats and landscapes that will be most resilient in the face of climate change. The new BioMap also incorporates local and regional scaling and a habitat restoration resource center, providing a holistic tool to guide habitat conservation.

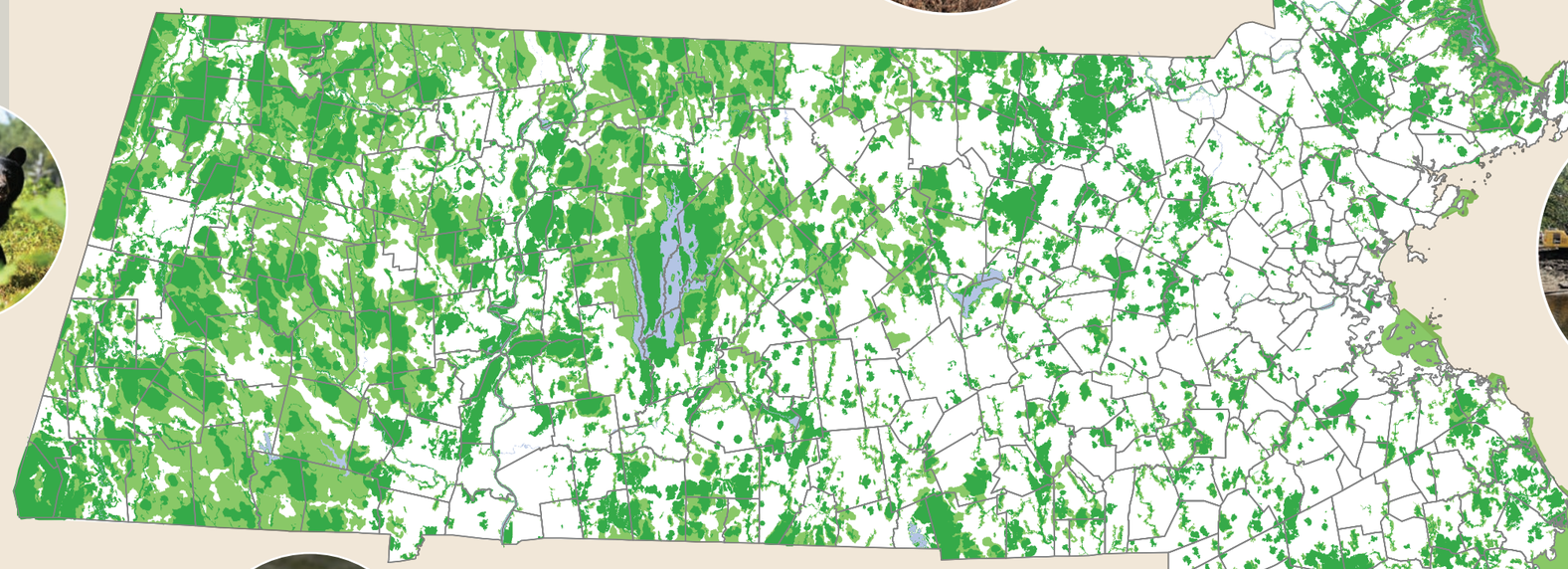
BioMap facilitates coordination and collaboration among individual conservation practitioners where each entity represents one piece of the conservation puzzle. Landscape-level conservation in the Commonwealth relies on effective working partnerships to achieve a greater collective success. With BioMap, the whole is greater than the sum of its parts.

Through the strategic protection of lands and waters that are most important for safeguarding biodiversity, we can accomplish so much more! BioMap is an effective tool for protecting healthy, robust ecosystems; clean air and water; employment opportunities; and beautiful spaces for recreation. With BioMap, a diversity of users can come together around shared goals of protecting our natural lands and the integrity of the landscapes where we live and work. This will ensure a vibrant quality of life, now and for future generations.

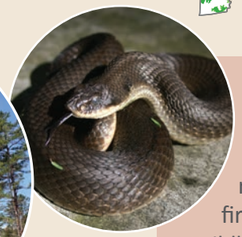
BIOMAP IN ACTION

The Great Gales Brook Conservation Project has protected more than 700 acres in Warwick, Orange, and Royalston through a locally led community conservation effort involving multiple land trusts, municipalities, state agencies, and landowners.

Recently protected lands in Sandisfield and New Marlborough on the Berkshire Plateau help secure a network of large Landscape Blocks, which enhance movement corridors for wildlife like black bear and moose and reduce the pace of climate change through carbon storage.



Stream connectivity was restored with the successful removal of the Turner Dam on the Nissitissit River. This project improved habitat for aquatic species including the Brook Floater, eliminated a public safety hazard, reduced flooding risks, and enhanced climate resiliency.



MassWildlife, the Town of Montague, and other partners have reintroduced prescribed fire on the Montague Plains Wildlife Management Area, one of the largest inland pine barrens in New England. These efforts benefit numerous at-risk and common species and dramatically reduce the risk of catastrophic wildfire.

In 2018, American chaffseed, a federally endangered plant not seen within MA since 1965, was rediscovered. This plant requires disturbance on the landscape such as fire or mowing.

Core Habitat

Critical Natural Landscape

Through the designation of Core and Critical Natural Landscape, BioMap prioritizes and informs land acquisitions and habitat restoration and management projects that are critical to maintaining biodiversity.

BIOMAP:
A UNIFYING VISION

Long embraced by the conservation community, BioMap has evolved into a web-based framework developed with the most advanced technology, using updated data displayed at multiple geographic scales and the latest climate resilience science. As our understanding of biodiversity and its threats continues to grow, BioMap will continue to evolve to meet the changing needs of our changing world.

BioMap envisions a future where the full complement of Massachusetts plants, animals, and habitats thrive side by side with people who have ample access to nature and outdoor recreation, within a climate-resilient landscape. It is a Map. A Tool. And a Vision.

BioMap was funded through support from Massachusetts Executive Office of Energy and Environmental Affairs, Massachusetts Department of Fish and Game, and The Nature Conservancy.

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